cont. 1.1 a2

means and the receiving means are located remote from the laser and the detection means and are connected to them by the optical fiber connection means. —

Please replace the paragraph beginning at page 5, line 24, with the following rewritten paragraph:

a3

— It has been found that a single mode fiber can be used and that the returned beam can be readily focused on the end of the optical fiber, despite its small diameter, so that the single fiber can be used for both transmission and reception. Also, despite the requirement to provide splitter and combiner means at the laser, high efficiencies can be achieved. —

Please replace the paragraph beginning at page 7, line 23, with the following rewritten paragraph:

a4

— Figure 4b is a schematic view of fiber optic connections showing the use of multiple lasers in a second embodiment of the invention; —

Please replace the paragraph beginning at page 13, line 1, with the following rewritten paragraph:

a5

— A single laser controller 10 may hold and control several lasers and by means of a beam splitter can feed light to single or several probes simultaneously. As the controller 10 is linked to a computer, the computer, in addition to manipulating and storing data, can also electronically control the operation of the controller 10. —

**In the Claims:**

Please cancel claims 1 to 20, without prejudice, and insert new claims 21 to 52 as follow:

SUB B1

a6

21. (New) An apparatus for monitoring selected trace constituent gases in the atmosphere, the apparatus comprising:

(a) a laser tuneable over a range of frequencies for generating a laser beam;

(b) control means to control the frequency of the laser to scan across an absorption range encompassing an absorption line of a selected trace constituent gas of interest;

(c) transmission means to transmit the laser beam through a region of the atmosphere;

(d) detection means for detecting the laser beam after transmission through the region of the atmosphere; and

(e) processing means for providing the concentration of the selected constituents by comparing the detected laser beam to the transmitted laser beam.

22 (New) An apparatus as claimed in claim 21 wherein the control means comprises a generator means to control the frequency of the laser to rapidly scan across the absorption range of interest.

23. (New) An apparatus as claimed in claim 22 wherein the generator is a ramp generator.

Cont. a6

24. (New) An apparatus as claimed in claim 23 wherein the ramp generator has a frequency in the range of 10–100 kHz

25. (New) An apparatus as claimed in claim 21 wherein the control means comprises a mixer to create a frequency modulated laser beam.

26. (New) Apparatus according to claim 21 further comprising an optical fiber connection means providing a connection between the laser and the transmission means and providing a connection between the detection means and the processing means.

27. (New) An apparatus as claimed in claim 26 wherein the optical fiber connection means comprises an optical fiber connecting the laser to the transmission means, and connecting the detection means to the processing means for transmission of a returned beam.

28 (New) An apparatus as claimed in claim 27 wherein the optical fiber is a single mode fiber.

29. (New) An apparatus as claimed in claim 28 further comprising a beam splitter and combiner means connected between the laser and the optical fiber, the beam splitter and combiner means also being connected to the processing means.

30. (New) An apparatus as claimed in claim 29 further comprising a reference cell connected to the beam splitter and combiner means for receiving part of the radiation from the laser, for reference purposes.

31 (New) An apparatus as claimed in claim 30 comprising a plurality of lasers, and, for each laser, a respective beam splitter and combiner means connected thereto and a reference cell and a detector both connected to the beam splitter and combiner means, and wherein the

apparatus includes a first multiplexer means having a plurality of connections on one side, each connected to one of the beam splitters and combiner means, and a connection on the other side to the transmission means and the detection means.

32. (New) An apparatus as claimed in claim 31 further comprising a second multiplexer means having an input connected to the other side of the first multiplexer means, and a plurality of outputs and wherein the apparatus includes a plurality of pairs of transmission means and receiving means, each pair of transmission and receiving means being connected to one output of the second multiplexer means.

33. (New) An apparatus as claimed in claim 26 further comprising at least one of: (a) multiplexer means and a plurality of pairs of transmission means and detection means, the multiplexer means providing a connection between the optical fiber connection means and the pairs of transmission and detection means for selective connection to one pair thereof, and (b) a plurality of lasers and beam splitter and combiner means connecting the lasers to the optical fiber connection means for simultaneous transmission and reception of at least two different laser beams.

34. (New) An apparatus as claimed in claim 26 wherein the optical fiber transmission means comprises a first optical fiber connecting the laser to the optical transmission means, and a second optical fiber transmitting a returned beam from the detection means to the processing means, wherein the apparatus includes a plurality of pairs of optical transmission means and detection means, wherein each of the first and second optical fibers comprises a first portion and a plurality of second portions, wherein the apparatus further includes a first optical multiplexer having an input connected to the first portion of the first optical fiber, the other end of which is connected to the laser, wherein the plurality of second portions of the first optical fiber provide connections between the first multiplexer and the optical transmission means, wherein a second multiplexer has an output connected to the first portion of the second optical fiber, the other end of which is connected to the detection means, and wherein the plurality of second portions of the second optical fiber provide connections between the second multiplexer and the detection means, the first and second multiplexers being operable to connected a selected pair of the transmission means and the receiving means to the laser and the detection means.

35. (New) An apparatus as claimed in claim 32 comprising a plurality of lasers, and beam splitter and combiner means for combining the outputs from the lasers for communication through the first optical fiber and wherein each laser has an associated beam splitter and combiner means to which its output is connected, each of which beam splitter and combiner means has one output providing a connection to the first optical fiber and another output connected to a reference cell.

36. (New) An apparatus as claimed in claim 26 wherein the detection means is separate from the optical transmission means, for mounting on either side of an area through which the trace constituents to be analyzed passes, and wherein the optical fiber connection means comprises a first transmission optical fiber connecting the laser to the optical transmission means, and a second return optical fiber transmitting a returned beam from the detection means to the processing means.

37 (New) An apparatus as claimed in claim 34 wherein the transmission means and the receiving means comprise a point source monitor, including a multipass sample cell, providing an extended analytical path and wherein the optical fiber connection means comprises a first, transmission optical fiber connecting the laser to the optical transmission means, and a second, return optical fiber transmitting a returned beam from the receiving means to the detector means

38 (New) An apparatus for the remote detection of selected trace constituent gases in the atmosphere, in use with an installation comprising at least one stack for discharging flue gases to the atmosphere and at least one building providing an enclosed area, the apparatus comprising:

(a) a laser tuneable over a range of frequencies for generating a laser beam;

(b) control means to control the frequency of the laser to scan across an absorption range encompassing an absorption line of a selected trace constituent gas of interest;

(c) transmission means to transmit the laser beam through the flue gas;

(d) detection means for detecting the laser beam after transmission through the flue gas;

(e) processing means for providing the concentration of the selected constituents by comparing the detected laser beam to the transmitted laser beam.

(f) a multiplexer means providing a connection between the laser and the transmission means and between the detection means and the processing means; and

(g) an optical fiber connection means providing a connection between a laser and the optical transmission means and between the detection means and the processing means;

wherein the transmission means and the detection means are mounted to one stack adjacent the top thereof, whereby a laser beam is transmitted through the flue gases discharged in the stack, and wherein the laser, the detection means and the multiplexer means are located in the enclosed area of the building, whereby the laser, the detection means and the multiplexer means are protected by the building, the pairs of optical transmission means and detection means are remote from the laser and the detection means and are connected thereto by the optical fiber connection means, and the multiplexer means can selectively connect the laser to any one pair of the optical transmission means and the detector means.

39 (New) An apparatus as claimed in claim 38 comprising a plurality of lasers, and wherein a beam splitter and combiner means is connected to the lasers, wherein each laser has a respective reference cell connected to the beam splitter and combiner means for receiving a portion of the radiation thereof for reference purposes, and wherein a detector is provided for each laser, connected to the beam splitter and combiner means for receiving a portion of the radiation returned back to the detector.

40 (New) An apparatus as claimed in claim 39 that includes a plurality of lasers and beam splitter and combiner means providing a connection between the lasers and the multiplexer means.

41. (New) An apparatus as claimed in claim 40 wherein the beam splitter and combiner means provides an output for a reference signal from each laser and includes reference cell means connected to the output of the beam splitter and combiner means.

42. (New) An apparatus as claimed in claim 41 wherein the beam splitter and combiner means receives the returned laser beam and includes a further output connection connected to the detection means.

43. (New) An apparatus as claimed in claim 42 wherein the multiplexer means has a first multiplexer having a plurality of connections on one side, connected to the transmission means

and the detection means, and having a first pair of connection ports on the other side, and a second multiplexer comprising a plurality of connections on one side connected to the lasers and the detection means, and a second pair of connection ports on the other side connected to the first pair of connection ports of the first multiplexer.

44. (New) An apparatus as claimed in claim 38 wherein the multiplexer means has a plurality of connections on one side connected to the transmission means and the detection means and a connection port on the other side thereof, and wherein the apparatus includes a plurality of beam splitter and combiner means which are connected together to form a single connection connected to the connection port of the multiplexer means and which are connected to the lasers and to the detection means, whereby each laser beam is connected through to the multiplexer means and a return beam is connected through to the detection means, and wherein the beam splitter and combiner means provide outputs for reference signals from the lasers, the apparatus including reference cell means connected to said outputs.

45. (New) A method of monitoring selected trace constituent gases in the atmosphere, the method comprising.

(a) transmitting a laser beam tuneable over a range of frequencies through a region of the atmosphere to be monitored;

(b) controlling the frequency of the laser to scan across an absorption range encompassing an absorption line of a selected trace constituent gas of interest;

(c) detecting the transmitted laser beam after transmission of the beam through the region of the atmosphere; and

(e) determining the concentration of the selected constituents by comparing the detected laser beam to the transmitted laser beam.

46. (New) A method according to claim 45 wherein the laser beam is transmitted across a road for monitoring exhaust plumes from a vehicle.

47 (New) A method according to claim 45 wherein the laser beam is transmitted through a flue gas discharged from a stack.

48 (New) A method according to claim 45 wherein the laser beam is transmitted through a flue gas inside a stack.

49. (New) A method according to claim 45 wherein a generator means is provided to control the frequency of the laser to rapidly scan across the absorption range of interest.

50. (New) A method according to claim 49 wherein the generator is a ramp generator.

51. (New) A method according to claim 50 wherein the ramp generator has a frequency in the range of 10–100 kHz.

52. (New) A method according to claim 45 wherein a mixer is provided to create a frequency modulated laser beam.